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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Hiroki KANAI
Application No.: 10/654,996
Filed: September 5, 2003
For: STORAGE DEVICE CONTROL APPARATUS AND CONTROL
METHOD FOR HTE STORAGE DEVICE CONTROL
APPARATUS
Group: 2182
Special Programs
Examiner: Pinchus M. Laufer

REQUEST FOR RECONSIDERATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

June 6, 2005

Sir:

In response to the Decision on Petition dated April 28, 2005, reconsideration and withdrawal of the Decision is respectfully requested in view of the following remarks.

REMARKS

Initially, in the Decision on Petition dated April 28, 2005, the Examiner notes that the Petition to Make Special filed January 31, 2005 is defective for failing to discuss how the language of each of the independent claims is specifically distinguishable and patentable from each of the references.

The present invention as recited in the claims filed are not taught or suggested by any of the above noted references whether taken individually or in combination with each other or in combination with any of the other references now of record.

The present invention as recited in the claims is directed, at a minimum, to a storage device control apparatus that includes: a mounting part capable of removably mounting: channel control units, each with a host interface controller formed therein for receiving data I/O requests, disk control units, each with a disk interface controller formed therein for performing I/O control of the data to storage volumes storing data in response to the data I/O requests, cache memory units, each with a memory formed therein for storing the data, and storage control units, each with the host interface controller, the disk interface controller, and the memory formed therein, and an internal connection part for connecting the channel control units, the disk control units, the cache memory units, and the storage control units in a communicable manner.

It is submitted that the cited references, whether considered alone or in combination, fail to disclose or suggest the invention as claimed. In particular, the

cited references, at a minimum, fail to disclose or suggest a storage device control apparatus that includes a mounting part capable of removably mounting: channel control units, disk control units, cache memory units, storage control units, and an internal connection part for connecting the channel control units, the disk control units, the cache memory units, and the storage control units in a communicable manner, and/or a control method that includes: receiving the data I/O request at one of said storage control unit; referring to the information by the storage control unit to identify the unit to perform I/O control to the storage volume to which the data I/O request is directed; and performing the I/O control by the storage control unit when the unit to perform the I/O control is the storage control unit, or letting another storage control unit perform the I/O control when the unit to perform the I/O control is not the storage control unit.

All of the independent claims recite at least one of these features. In particular, independent claim 1 recites a mounting part capable of removably mounting: channel control units, each with a host interface controller 310 formed therein for receiving data I/O requests, disk control units, each with a disk interface controller formed therein for performing I/O control of the data to storage volumes storing data in response to the data I/O requests, cache memory units, each with a memory formed therein for storing the data, storage control units, each with the host interface controller, the disk interface controller, and the memory formed therein, and an internal connection part for connecting the channel control unit, the disk control unit, the cache memory unit, and the storage control unit in a communicable manner.

Independent claim 5 recites a mounting part capable of removably mounting: channel control units, each with a host interface controller formed therein for receiving data I/O requests, disk control units, each with a disk interface controller formed therein for performing I/O control of the data to storage volumes storing data in response to the data I/O requests, cache memory units, each with a memory formed therein for storing the data, storage control units, each with the host interface controller, the disk interface controller, and the memory formed therein; and an internal connection part for connecting the channel control unit, the disk control unit, the cache memory unit, and the storage control unit in a communicable manner, and a control method that includes: receiving the data I/O request at one of said storage control unit; referring to the information by the storage control unit to identify the unit to perform I/O control to the storage volume to which the data I/O request is directed; and performing the I/O control by the storage control unit when the unit to perform the I/O control is the storage control unit, or letting another storage control unit perform the I/O control when the unit to perform the I/O control is not the storage control unit.

The references considered most closely related to the claimed invention are briefly discussed below:

U.S. Patent No. 6,651,154 (Burton et al.) discloses implementations that describe the expansion of storage space in an array of storage units. The storage space formed by the storage units is configured as logical units to store data.

Storage units are added to the array to form an expanded storage space. The storage units in the array prior to the addition of the storage units are in a pre-expansion storage space. At least one additional logical unit is configured in the expanded storage space such that the logical units existing prior to the addition of the storage units in the pre-expansion storage space are not affected by the logical units configured in the expanded storage space. However, Burton et al. does not disclose or suggest, at a minimum, a storage device control apparatus that includes a mounting part capable of removably mounting: channel control units, disk control units, cache memory units, storage control units, and an internal connection part for connecting the channel control units, the disk control units, the cache memory units, and the storage control units in a communicable manner (claims 1 and 5), and/or a control method that includes: receiving the data I/O request at one of said storage control unit; referring to the information by the storage control unit to identify the unit to perform I/O control to the storage volume to which the data I/O request is directed; and performing the I/O control by the storage control unit when the unit to perform the I/O control is the storage control unit, or letting another storage control unit perform the I/O control when the unit to perform the I/O control is not the storage control unit (claim 5).

U.S. Patent No. 6,763,398 (Brant et al.) discloses a storage controller for redundant arrays of independent disks (RAID) that comprises a daughter card containing a standardized controller core, which is mated to one of a number of customizable controller interface cards. The controller core card includes high

performance elements such as a processor, cache memory, CRC circuitry, a host port, and a storage port. All operational communication with non-core components occurs via the host port and the storage port through the controller interface card. The controller core card monitors and configures communications between the host and the storage array. Each controller interface card is populated with components and connectors particular to the respective application or RAID system. The size and layout of the controller interface card may also be customized to the particular application. Sharing the same controller core card among various RAID controllers lowers the cost and time-to-market for customized RAID systems. However, Brant et al. does not disclose or suggest, at a minimum, a storage device control apparatus that includes a mounting part capable of removably mounting: channel control units, disk control units, cache memory units, storage control units, and an internal connection part for connecting the channel control units, the disk control units, the cache memory units, and the storage control units in a communicable manner. Brant et al. discloses the devices being built into the controller core card, and not being individually removable (claims 1 and 5), and/or a control method that includes: receiving the data I/O request at one of said storage control unit; referring to the information by the storage control unit to identify the unit to perform I/O control to the storage volume to which the data I/O request is directed; and performing the I/O control by the storage control unit when the unit to perform the I/O control is the storage control unit, or letting another storage control unit perform the I/O control when the unit to perform the I/O control is not the storage control unit (claim 5).

U.S. Patent Publication No. 2001/0047462 A1 (Dimitroff et al.) discloses a cascaded removable media data storage system that includes a first level enhanced removable media data storage system controller connected to a host or server computer network. Connected in parallel to the enhanced first level removable media data storage system controller are at least two enhanced second level removable media data storage system controllers. Each enhanced second level removable media data storage system controllers is connected to a mirrored group of removable media data storage units. However, Dimitroff et al. does not disclose or suggest, at a minimum, a storage device control apparatus that includes a mounting part capable of removably mounting: channel control units, disk control units, cache memory units, storage control units, and an internal connection part for connecting the channel control units, the disk control units, the cache memory units, and the storage control units in a communicable manner (claims 1 and 5), and/or a control method that includes: receiving the data I/O request at one of said storage control unit; referring to the information by the storage control unit to identify the unit to perform I/O control to the storage volume to which the data I/O request is directed; and performing the I/O control by the storage control unit when the unit to perform the I/O control is the storage control unit, or letting another storage control unit perform the I/O control when the unit to perform the I/O control is not the storage control unit (claim 5). Dimitroff et al. merely discloses controllers 110 connected to storage units 140.

U.S. Patent Publication No. 2003/0224824 A1 (Hanson) discloses a system and method that employs radio communication to transfer information between modular components removably installed in a cabinet such as may be employed for storage systems. Radio signals may be confined to the interior of the cabinet. Other radio signals may communicate from the cabinet to external monitoring equipment. A radio transceiver and antenna are provided as part of each modular component. A master unit may enumerate components, determine type, model, versions of components and may monitor operating conditions that may comprise voltage, current, temperature, fan rotation rate, data throughput and other variables. The master unit may process acquired information, may store information, or may transfer information to another system for processing. However, Hanson does not disclose or suggest, at a minimum, a storage device control apparatus that includes a mounting part capable of removably mounting: channel control units, disk control units, cache memory units, storage control units, and an internal connection part for connecting the channel control units, the disk control units, the cache memory units, and the storage control units in a communicable manner (claims 1 and 5), and/or a control method that includes: receiving the data I/O request at one of said storage control unit; referring to the information by the storage control unit to identify the unit to perform I/O control to the storage volume to which the data I/O request is directed; and performing the I/O control by the storage control unit when the unit to perform the I/O control is the storage control unit, or letting another storage control unit

perform the I/O control when the unit to perform the I/O control is not the storage control unit (claim 5).

Therefore, since the references fail to disclose a storage device control apparatus that includes a mounting part capable of removably mounting: channel control units, disk control units, cache memory units, storage control units, and an internal connection part for connecting the channel control units, the disk control units, the cache memory units, and the storage control units in a communicable manne, and/or a control method that includes: receiving the data I/O request at one of said storage control unit; referring to the information by the storage control unit to identify the unit to perform I/O control to the storage volume to which the data I/O request is directed; and performing the I/O control by the storage control unit when the unit to perform the I/O control is the storage control unit, or letting another storage control unit perform the I/O control when the unit to perform the I/O control is not the storage control unit, it is submitted that all of the claims are patentable over the cited references.

U.S. Application No. 10/654,996

Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of Mattingly, Stanger, Malur & Brundidge, P.C., Deposit Account No. 50-1417 (referencing attorney docket no. 500.43106X00).

Respectfully submitted,

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